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ABSTRACT

This paper provides information concerning a technique for indexing internal processing during reading. The paper details three criteria necessary for a viable index, discusses techniques currently used for indexing reading behavior, and describes a technique known as "disruptive effect"--the degree to which the probability of occurrence of oral reading errors is increased by the inclusion of an unknown or confusing word or structural element in written context. Three studies were completed to substantiate the existence of the effect and to utilize the effect in a more specific way. The paper presents several explanations for the existence of the effect and expresses the hope that, since the technique has proved useful for reading research and since its potential is unknown, other researchers may see new applicability for its use as an index. (JM)

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Abstract

Disruptive Effect: A New Technique for Reading Research

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Examines the viability for index of internal processing during reading. Criteria for useful dependent variables sensitive to processing strategies are established. The disruptive effect technique is defined and examined relative to these criteria. Other currently used techniques are also examined. These studies substantiate the existence of the effect and demonstrate several different designs in which it has proved useful. Several potential explanations for the existence of disruptive effect are presented. A call to other reading researchers to examine possible uses of the effect as a research technique is issued.

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Disruptive Effect: A New Technique for Reading Research

Objectives

The purpose of this paper is to provide information concerning a technique for indexing internal processing during reading. A technique referred to as the "disruptive effect" will be described. "Essentially, disruptive effect is the degree to which the probability of the occurrence of oral reading errors is increased by the inclusion of an unknown or confusing word or structured element in written context." (Isakson and Miller 1976) The results of three studies in which it has been successfully employed will be briefly summarized. The results of the studies indicate that the disruptive effect is sensitive to a number of predictable differences in children's reading behavior. Furthermore, the described technique is shown to meet all of the other requirements for a useful index of internal reading behavior set forth by the authors, while avoiding a number of potential pitfalls.

Criteria for a Viable Index

At times, it is necessary to be able to assess on-going reading processing with an externally observable index capable of localizing the effect of a treatment.

We have identified three related requirements that an index of internal processing must meet to be useful for our research. The first is that the technique be applicable to children. The second requirement is that the technique allow us to study reading in a natural, non-laboratory setting. Thirdly, it has been necessary to find a way of monitoring processing activity without incurring the expense of elaborate equipment.

Currently Used Techniques

Several techniques have been employed in various situations in

an attempt to index reading behavior. Two of the most common are time spent reading a given text (reading time) and the reader's performance on a test over the material read (comprehensive score). However, both of these measures are taken after processing has occurred and thus sensitivity to specific elements in the text may not be directly attributed to scores obtained. The effect of experimental manipulation cannot be localized by means of reading time and comprehension score.

Another set of techniques holds promise of meeting some of our requirements for an index of internal processing. These include physiological measures such as the tracking of eye movements during reading, the measurement of pupil size during reading, and the measurement of response latency to signals perceived during reading. Each of these techniques potentially meet the requirements of indexing on-going, internal activity and localizing the effect of experimental manipulation. However, none of them meet all three of the remaining requirements. They all present difficulty in use with young children. Additionally, they all involve marked departures from reading in a natural setting. Finally, and perhaps most importantly, they all requiresophisticated and expensive equipment which is beyond the means of many people engaged, or potentially engaged in reading research.

The Disruptive Effect Technique

Due to the inability of the existing techniques to meet the requirements for an index of processing activity, the present authors have employed a technique referred to as the disruptive effect.

All three of the studies reviewed (Miller 1975, Miller in press, Isakson & Miller in press) used confusing elements interjected into normal text and indexed the degree of resulting disruption as measured

by increase in the incidence of oral reading errors on the immediately surrounding context. The studies differed in the types of confursing elements used, the positions in the sentence where elements were injected, the age level of the students, and the word positions at which sensitivity was noted. Studies one and two were completed primarily for the purpose of establishing the exsitence of disruptive effect, while study three utilized the effect in a more specific way.

Study One

Forty second-grade students read stories with specifically designed "pseudo" words interjected into normal context at verb, noun and adjective positions to determine the effect of an unknown word on the reading of surrounding context. Each student read an unmodified and a modified version of a story counterbalanced for order of presentation. The modified version of the story substituted pseudo words such as spacked for real words such as walked. Oral reading errors were tabled for each word position in the story. It was hypothesized that:

1. More errors would be made on words surrounding pseudo words than would be made on the same words in a control or unmodified condition.
2. Modified verbs would produce more surrounding errors than modified nouns or adjectives.
3. Modified words bearing a correct morphenic marker would produce less surrounding errors than would a modified word with an incorrect marker.

Hypothesis one was supported. Analysis of the data indicated the existence of the disruptive effect phenomena. Hypothesis two and three were not significantly supported, although both data patterns indicated trends in the hypothesized direction.

The results of the study demonstrated that three word positions before and after a modification were sensitive to disruption and that two word positions before and after modification were particularly sensitive.

Study Two

One hundred and eight subjects from first, second or third grade and of high, middle, or low comprehension ability read stories with specifically designed "pseudo" words injected into normal text. Their degree of disruption was indexed with the same procedures as used in study one. The invependent variable, grammatical position, was limited to subject noun and main verb. The modifications either bore either correct or incorrect morphenic markers as in study one. Each subject read one story with four sentences containing modifications and four sentences in the control condition in a repeated measures design counterbalanced for order of presentation. It was hypothesized that:

1. More errors would be made on the two words before and after a modification than on the same words in the control condition.
2. The degree of disruption would be greater for second and third grade students than for first grade students.
3. The degree of disruption would be greater for high and middle comprehending students than for low comprehenders.
4. More errors would be made on words surrounding verbs than on words surrounding nouns.
5. More rrrors would be made on words surrounding incorrectly morphenically marked words than on words surrounding correctly marked words.

Hypothesis one, two, and three were supported. The existence of

disruptive effect was again supported. Also second and third grade readers experienced more disruptions than did first grade readers and readers of higher comprehension level experienced more disruption than readers of low comprehension level.

The results of this study again indicated that the two words before and after a modification were very sensitive to disruption.

Study Three

Forty-eight fourth grade children equivalent on word recognition skills, but differing in comprehension ability, read sentences manipulated at the verb position to determinw whether sensitivity to syntactic and semantic cues differed between good and poor comprehenders. An interaction between ability level of the students and sentence type was hypothesized. Four different word positions were utilized as dependent variables to index sensitivity to disruptive effect. Data in the form of oral reading errors at the verb position support the hypothesis that poor comprehenders are not affected by the disruptive effect of syntactic and semantic violations while good comprehenders exhibit an increasing number of errors across semantic and syntactic/semantic violations. Data from the other three dependent variables were in the direction hypothesized though not significant.

Sentences of three types were read:

A. The old farmer planted the bean seeds in the rich, brown soil.

B. The old farmer paid the bean seeds in the rich, brown soil.

C. The old farmer went the seeds in the rich, brown soil.

Type A sentences were meaningful transitive sentences. Type B sentences had a transitive verb substituted which made the sentence anomalous in meaning but did not violate any syntactic constraints.

Type C sentences had an intrasitive verb substituted which violated both semantic and syntactic constraints.

An interaction between ability level of the students and sentence type was hypothesized. Four different word positions were utilized as dependent variables to index sensitivity to disruptive effect.

Summary of studies

In each study, the on-going processing was indexed and the effect of treatment was localized. In addition, the studies were carried out with beginning readers in a natural, classroom setting, at very little expense.

Explanation for the existence of the effect

The perception of certain aspects of a sentence which are under experimental manipulation trigger a disruption in the normal reading behavior which leads to a localized increase in oral reading errors. It follows that if the reader does not perceive the aspect of the text under experimental manipulation, no disruption in the form of increased errors will occur. Thus, readers expected to be performing at different ability levels can be compared on the degree to which they are employing the processes upon which the disruption depends. As in the case of study three, readers who lagged behind in the use of a given strategy (sensitivity to syntactic and semantic constraints) were not affected by the potentially disruptive element in the sentence and therefore did not show an increase in errors. Readers employing the strategy were affected by the disruptive element as indicated by an increase in their errors.

Conclusions

The disruptive effect technique has proved to be a useful tool for reading research. It meets the requirements for the type of research conducted by the present authors and it avoids some of the

limitations of other indecies. The potential of the technique is unknown. It is hoped that other researchers may see new applicability for its use as an index to ongoing processing strategies of the reader.